MASTER OF SCIENCE
IN
SYSTEMS TECHNOLOGY

DEVELOPING A CONCEPTUAL UNMANNED AERIAL VEHICLE COMMUNICATIONS MOBILE AD HOC NETWORK SIMULATION MODEL

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A growing demand for increased networking interoperability has spawned a requirement for ad hoc networking. One proposal to satisfy the need is development of Unmanned Aerial Vehicle (UAV) communications Mobile Ad Hoc Networks (MANET). In order to establish these UAV MANETs, a large set of Internet Protocol (IP) based routing protocols must be analyzed to determine suitability for incorporation into the UAV MANET.

This thesis represents the initial phase in developing a simulation model to look at routing performance parameters for the conceptual UAV MANET. The Optimum Network Performance (OPNET) simulation software tool was used for this analysis. Analysis and simulations of the Ad Hoc On-Demand Vector Protocol (AODV), Dynamic Source Routing protocol (DSR), and Zone Routing Protocol (ZRP) were conducted to determine their suitability for the UAV MANET model. Results conclude that some routing protocols are more suitable for military operations than others and that development of MANET gateway models are required. Additionally, network management and security issues for this conceptual network are addressed.

KEYWORDS: Optimum Network Performance simulation tool, OPNET, Zone Routing Protocol, ZRP, Mobile Ad Hoc Networks, MANET, Unmanned Aerial Vehicle, UAV, Ad Hoc On-Demand Vector Protocol, AODV, Dynamic Source Routing protocol DSR, Thesis, NPS, Naval Postgraduate School

SCENARIO DESIGN: ADAPTIVE ARCHITECTURE FOR COMMAND AND CONTROL EXPERIMENT EIGHT

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The Adaptive Architectures for Command and Control (A2C2) project is an ongoing research effort sponsored by the Office of Naval Research to explore adaptation in joint command and control. The objective of the project's eighth experiment is to study the adjustments that organizations make when they are confronted with a scenario for which their organizational is ill-suited. To accomplish this, teams will each be in on of two fundamentally different organizational structures (functional and divisional), and each will play two scenarios – one for which their organization is well-suited and one for which it is ill-suited. The purpose of this thesis is to design, test, and implement two scenarios. The background of the A2C2 program and design process of each scenario is described to provide a clear understanding of the methodology behind designing scenarios focusing on specific objectives. Each scenario will prove to be better mission and task oriented for one organizational structure than for the other organizational structure. The Modular Command and Control Evaluation Structure (MCES) is used to design the two scenarios. The Distributed Dynamic Decision-making (DDD) Software is used to implement, pilot and run the scenarios. Both scenarios are to be used for the Adaptive Architectures for Command and Control (A2C2) Experiment Eight in August 2002.

KEYWORDS: Scenario Design, DDD, A2C2, Joint C4I, ONR

TERRAIN CATEGORIZATION USING MULTI-ANGLE PANCHROMATIC IMAGERY (U)

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Abstract is classified

KEYWORDS: Remote Sensing, Terrain Categorization, Imagery, Change Detection

TECHNIQUES TO REDUCE SMEARING IN SAR IMAGERY OF OCEAN VESSELS (U)

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Abstract is classified

KEYWORDS: Remote Sensing, Synthetic Aperture Radar, Dynamic Imaging, Ship Recognition

A SIMPLIFIED OPNET MODEL OF THE JOINT SERVICES IMAGERY PROCESSING SYSTEM - NAVY

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Network modeling is a useful tool in analyzing and assessing a network's performance; it is also able to supply network managers pertinent data on how the network might react to system or hardware modifications. The purpose of this thesis is to model and simulate the Concentrator Architecture within the Joint Services Image Processing System - Navy (JSIPS-N) network and demonstrate how modeling can be a useful tool when evaluating communication networks. A simplified model of the JSIPS-N network was constructed. Under the parameters and limitations of this model, pertinent data was identified and used to evaluate network performance under different operating conditions.

KEYWORDS: JSIPS-N, Data Transfer, File Transfer Protocol, OPNET, Network Modeling

INTELLIGENCE SUPPORT TO COMPUTER NETWORK ATTACK OPERATIONS (U)

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KEYWORDS: Computer Network Attack, Information Warfare, Information Operations, Information Superiority, Intelligence Support to CNA, Intelligence Organizations, and CNA

COMMUNITY-BUILDING AND PERMISSION MARKETING IN AN INFORMATION OPERATIONS PERCEPTION MANAGEMENT CAMPAIGN

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The basis and foundations of Internet-based Information Operations as researched by previous thesis students James Mayer, David Flowers and Robert Thompson, are further detailed in this study of effective application of current marketing tools in an Internet-based Perception Management campaign. Attracting users, then gaining trust and building loyalty for the purpose of gradually indoctrinating target audiences to the desired viewpoint and affecting them to the intended behavior is the focus of this thesis. In addition to describing the aspects of an "attractive" Web site, concepts such as Permission Marketing and Community-Building are discussed in detail to describe their effectiveness in developing a relationship with the target audience. Application of the characteristics of an "attractive" Web site and loyalty development techniques is conducted in a fictional case study with the intent of providing insight as to how the Internet can be most effectively used in a Perception Management Information Operations campaign.

KEYWORDS: Information Operations, Perception Management, Web Site, Web Design, Internet-Based IO, Permission Marketing, Community-Building, Persuasion, Web-Based IO

MODELING AND SIMULATION OF THE JOINT SERVICES IMAGERY PROCESSING SYSTEM-NAVY (JSIPS-N) CONCENTRATOR ARCHITECTURE (JCA)

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The Joint Services Imagery Processing System – Navy (JSIPS-N) Concentrator Architecture (JCA) is being developed by the Navy to alleviate shortfalls in mission areas that require near real-time (NRT) delivery of imagery to afloat users. JCA will assist land attack and expeditionary warfare mission planners in receiving, screening, and exploiting imagery in operations requiring delivery of precision ordnance to time sensitive targets. JCA is expected to achieve Full Operational Capability (FOC) in 2003, when installed on all large-deck amphibious ships, aircraft carriers and command ships. This thesis employs modeling and

simulation of JCA, using OPNET network simulation software, to project performance in the areas of File Transfer Protocol response time and communication link and network device utilization. The intent is to determine whether requirements established in the JCA Operational Requirements Document (ORD) can be met by the network at FOC when the maximum number of end users will be connected to the Concentrator, JCA's central repository of imagery. Simulations conducted in two scenarios reflecting different levels of fleet operational tempo, peacetime and wartime, showed that JCA, as currently designed, is able to meet timelines for imagery delivery as mandated in the ORD, with no undue stress placed on communication links or network devices.

KEYWORDS: JCA, JSIPS-N, Imagery Dissemination, File Transfer Protocol, OPNET, Network Modeling and Simulation

DESIGNING THE VIRTUAL FINANCE OFFICE:
E-COMMERCE COMES TO DFAS
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All organizations, both private and public, must improve, streamline, and automate their business practices to adjust to rigorous demands of a highly volatile marketplace, austere financial resources, and manpower reductions. This thesis includes a conceptual discussion concerning the motivation and issues involved in becoming a VFO, as well as a proof-of-concept prototype. The prototype's overall architecture includes the following: User Interface (UI), Decision Support System with Personalization (DSS), Database (DB), and Workflows. The prototype addresses a small part of the overall VFO landscape, specifically, the MPDP process, and a small part of the overall personalization process. Generalizations are made from the experiences involved in building the prototype. The redesign alternatives take a comprehensive look at transformation enablers and information technology (IT) capable of eliminating the Personnel Administrative Clerks (PAC) and streamline the pay transaction process. The time is now for DFAS to leverage current and future technologies in such a manner that financial transactions in whatever fashion whether it is service member pay, commercial vendor pay, or contracting support can be accomplished electronically. Implementing the VFO along with other DFAS initiatives will begin this long process of transformational change, and provide better support to both soldier and customer alike.

KEYWORDS: Web-Based Transaction, Military Pay Document Process, Data Warehousing

AN INTRODUCTION TO COMMAND AND CONTROL
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Command and control activities have long been recognized as a vital part of military operations. From shouted battlefield commands to today's information-age warfare, it is those who have mastered the techniques and applications of command and control who have most often prevailed. As critical as it is to our success, it is a topic that is controversial, often poorly understood, and subject to wildly different interpretations.

This thesis examines the command and control process, consisting of people, information, and structure, and the interaction between the function of command and the systems that facilitate the process. It is intended to serve as a roadmap for the study of this topic from a foundational standpoint by first exploring the doctrinal definitions used throughout DoD and developing a sense of what command and control is, and equally important, what it is not. It then focuses on the components of the process and the dynamic relationships that exist between them. Finally, it considers our future, as outlined by such visions as JV2020 and Network-Centric Warfare, in hopes of identifying and understanding those things that will challenge us in developing an effective process.

Command and control influences every facet of warfare. In preparing for a future that calls for increased use of technology and systems, it is critical that we understand the process in order to remain an effective force.

KEYWORDS: Command, Command and Control, Organizational Theory, Decision-making, Network-centric Warfare